REMARKS/ARGUMENTS

Favorable reconsideration of the present application is respectfully requested.

In response to the objection to Claim 10, it has been amended such that it further limits the scope of Claim 1. Specifically, Claim 10 now recites that the glass sheet "is bent to have the shape" of an automobile window, and therefore further limits the bending limitation of Claim 1. The objection to Claim 10 is therefore believed to be moot.

The finality of the Restriction Requirement is noted and apparatus Claim 12 has been canceled. It has been replaced by new apparatus Claim 13 which is based upon Claim 1 but recites the control step in "means plus function" format. As such, it comprises a linking claim which must be examined with the method claims. See M.P.E.P. § 806.05(e).

Briefly, the claimed invention is directed to the bending of a glass sheet which is heated to be in a viscoelastic state. Applicants have discovered that a glass sheet in such a state can be bent to assume a complex shape with a bend having a small radius of curvature by bending the glass sheet against a mold having a certain bending surface while controlling the bending temperature T and bending time period t such that a bending evaluation index ϕ has a value between 0.05 and 2.00, wherein ϕ is defined as

$$\phi = \int_0^t \frac{P(\tau)}{\eta(T)} d\tau \quad \text{Formula 2}$$

where $P(\tau)$ is a surface pressure difference (unit: Pa) between a pressure applied on a primary surface of the glass sheet and a pressure applied on a rear surface of the glass sheet at a time τ, t is a bending time period (unit: s), $\eta(T)$ is the viscosity (unit: Pa·s) of the glass sheet at a temperature T, and T is a bending temperature (unit: °C) at the time τ.

Thus the bending evaluation index ϕ is an integration value based on the bending temperature and surface pressure difference between the pressure applied on a primary surface of the glass sheet and the pressure applied on a rear surface of the glass sheet at any

particular time τ. The bending operation is continued for a time t until the claimed bending evaluation index value is achieved.

Claims 1-9 and 11 were rejected under 35 U.S.C. § 112, first paragraph. According to Applicants' understanding, it is the position of the Office Action that the specification fails to enable the value P(τ) in equation 2. More particularly, because the specification describes, at lines 17-20 at page 9, that the invention does not depend on other factors so long as the claimed value of the bending evaluation index φ is satisfied, the claim is overly broad as including inoperative embodiments such as explosive bending or oscillation of the bending direction. According to the Office Action, since the bending conditions are not defined so as to exclude these inoperative embodiments, one skilled in the art could not practice the claimed invention without undue experimentation. This rejection is respectfully traversed.

As a threshold matter, Applicants note that a claim may not be rejected for lack of enablement simply because it reads on a large number of inoperative embodiments so long as one skilled in the art could determine which embodiments would be inoperative without undue experimentation. *Atlas Powder Co. v. E.I. Dupont Nemours & Co.*, 750 F.2d 1569, 1577 (Fed. Cir. 1984). This is particularly true in mechanical cases where a single embodiment can provide broad enablement. M.P.E.P. § 2164.03. For example, in *In re Cook*, 439 F.2d (CCPA 1971) [see also *Id.*], a claim directed to a zoom lens recited certain relationships amongst the design parameters of the lens which minimized image distortion. The claim was rejected under 35 U.S.C. § 112, in part because the claimed parameters did not take into account other factors necessary in the design of a zoom lens, and so it was asserted that one skilled in the art would not be taught how to perform the complex process of designing a zoom lens within the scope of the claim without undue experimentation. However, the court reversed the rejection, noting:

> Applicants do not purport to have solved all of the time-
> consuming problems involved in the design of a new lens ... .

> What they do claim to have done is to have discovered a simple
> set of relationships among some of the fundamental parameters
> involved in the design of zoom lenses which, if respected, will
> result in zoom lens assemblies which will be capable of
> zooming through a wider range than previous zoom lenses
> without experiencing an unacceptably high degree of image
> distortion at any point in their ranges of equivalent focal length
> variation ... . While Applicant's disclosure has not taught
> those skilled in the art how to design an entire new zoom lens
> in short order, it has taught those skilled in the art how to
> design a new zoom lens *of the type here claimed* without due
> effort. (See 439 F.2d at 734; emphasis in original).

The court also noted that:

> Many patent claims read on vast numbers of inoperative
> embodiments in the trivial sense that they can and do omit
> "factors which must be presumed to be within the level of
> ordinary skill in the art," [citation omitted], and therefore read
> on embodiments in which such factors *may* be included in such
> a manner as to make the embodiments inoperative. There is
> nothing wrong with this so long as it would be obvious to one
> of ordinary skill in the relevant art how to include these factors
> in such a manner as to make the embodiment operative rather
> than inoperative [citation omitted]. (*Id.*; emphasis in original).

The court found that the claims were enabled under 35 U.S.C. § 112 because "a

person skilled in the relevant art could determine which conceived but not-yet-fabricated

embodiments would be inoperative with expenditure of no more effort than is normally

required of a lens designer checking out a promised set of parameters" (*Ibid*).

In re Cook is believed to be particularly instructive with respect to the present

rejection under 35 U.S.C. § 112, first paragraph. As in *In re Cook*, the rejection is based on

the possible inclusion of inoperative embodiments (explosive bending or pressure reversal)

because the claims omit other factors which the specification describes as not affecting the

principle of the invention. However, as explained in *In re Cook*, the test is not whether one

skilled in the art could make these inoperative embodiments without undue experimentation,

but whether one skilled in the art could determine that such conceived embodiments would be

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inoperative without undue experimentation. See also *Atlas Powder v. Dupont, supra*;

M.P.E.P. § 2164.08(b).

Here, Applicants respectfully submit that one skilled in the art could determine that the explosive bending and pressure reversal embodiments mentioned in the Office Action are in fact inoperative without undue experimentation. The specification describes that the invention is based upon the glass sheet being viscoelastic (page 8, lines 7-22) wherein bending relies on viscoelastic flow. Explosive bending is performed too rapidly to permit viscoelastic flow and so one skilled in the art would recognize this to be inoperative without undue experimentation. Similarly, pressure reversal or oscillation would not bend the glass sheet and so this embodiment could also be determined to be inoperative without undue experimentation. Thus, the mere breadth of the claims such that they do not exclude such inoperative embodiments is not a sufficient basis to reject the claims under 35 U.S.C. § 112, first paragraph. This rejection is therefore traversed.

Applicants wish to thank Examiner Lazorcik for the courtesy of a brief discussion on January 17, 2007. It is Applicants' understanding from that discussion that the explanation set forth above would be sufficient to overcome the aforementioned rejection under 35 U.S.C. § 112, first paragraph.

Claims 1-9 and 11 were rejected under 35 U.S.C. § 103 as being obvious over U.S. patent 5,589,248 (Tomozane et al). However this rejection is also respectfully traversed.

The claimed invention is concerned with the formation of wrinkles and optical distortions in a glass sheet bent into a complicated shape with a small radius of curvature. See page 3, lines 1-14. Tomozane et al discloses a process for bending a flat glass sheet without the generation of cracks (paragraph bridging columns 7-8), something which requires less control sensitivity than preventing optical distortions.

Tomozane et al discloses bending the flat glass sheet along a line, wherein two flat sections are connected at the bend (column 2, lines 61-63). To this end, the glass sheet is preferentially heated to a viscoelastic temperature (at least 740°C; see column 4, lines 46-51; Figure 1B) along the bend line as shown in Figure 1B, and the glass sheet is bent at the bend line to produce the two flat portions connected at the bend, as shown in Figure 5.

Significantly, there is no teaching or suggestion in Tomozane et al that the bending operation is performed while controlling the bending temperature and/or time period according to a pressure differential or glass viscosity. Instead, Tomozane et al only describes that the bending operation can be completed within 1 to 5 minutes and that the bending speed, force and final bend angle are controlled to prevent the generation of cracks for a given glass shape and thickness. Tomozane et al therefore fails to teach or suggest a step of bending a glass sheet having a viscosity in the claimed range, in such a way as to maintain a bending evaluation index ϕ defined according to formula 2 of Claims 1 and 13 within the range defined by formula 1 of Claims 1 and 13.

Nor is it inherent that the control of the bending speed, force and shape in Tomozane et al to prevent cracks will result in a bending step conforming to the claimed value of the claimed bending evaluation index. Tomozane et al discloses a step of applying pressure to a non-heated and non-softened portion of the glass sheet which is to remain flat, so as to bend the glass sheet only along a heated bend line, without the generation of cracks. In contrast, the claimed invention involves bending the glass sheet against a bending surface of a mold while minimizing optical distortion. Since the portions of the glass sheet being pressed in Tomozane et al are not heated to have a viscosity of 10^8 poise, the process parameters are different from those of the present claims and so it is not inherent that the bending step being performed in Tomozane et al so as to prevent cracking will satisfy formulas 1 and 2 in Claims 1 and 13.

Since the bending step or means of Claims 1 and 13 is neither explicitly taught nor inherent in Tomozane et al, it is respectfully submitted that all of the claims define over this reference.
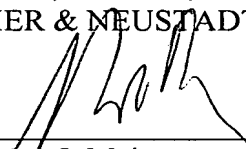
Claims 4 and 5 were further rejected under 35 U.S.C. § 103 as being obvious over Tomozane et al in view of U.S. patent 4,361,429 (Anderson) which was cited to disclose that the sheet conforms to the contour of a mold cavity, as well as trimming the glass sheet. However, whatever teaching Anderson may have in these respects, it provides no suggestion for controlling the bending operation of Tomozane et al such that it conforms to formulas 1-2 of Claim 1 by bending the glass sheet heated to the claimed temperature against a bending surface of a bending mold. The claims therefore define over any combination of the above references.

Claim 8 was rejected under 35 U.S.C. § 103 as being obvious over Tomozane et al in view of U.S. patent 5,071,461 (Hirotsu), wherein Hirotsu was cited to teach the use of the mold releasing agent recited in Claim 8. However, whatever teaching Hirotsu may have in this respect, it fails to overcome the shortcomings of Tomozane et al with respect to Claim 1, as discussed above. Similarly, U.S. patent 5,292,355 (Nikander), which was cited to teach the blowing and sucking steps of Claim 11, also fails to suggest modifying Tomozane et al to overcome the shortcomings thereof with respect to Claim 1, and so the claims are believed to define over any combination of the above references.

Applicants therefore believe that the present application is in a condition for

allowance and respectfully solicit an early Notice of Allowability.

Respectfully submitted,

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